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## **2011 EVALUATION OF SPINNING-WING DECOY BAN AT SHIAWASSEE RIVER STATE GAME AREA**

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### **ABSTRACT**

*A survey of waterfowl hunters was completed to estimate the number of hunters at Shiawassee River State Game Area (SGA) in 2011 and to determine the effects of banning spinning-wing decoys (SWDs) on waterfowl harvest and hunt quality. About 98% of waterfowl hunters at Shiawassee River SGA hunted ducks (1,418 hunters) and 74% hunted geese (1,065). Banning SWDs reduced the hunting efficiency of duck hunters that had previously used SWDs; however, overall duck harvest at Shiawassee River SGA since the ban was implemented in 2009 was little changed compared to harvest at hunt areas where SWDs were not banned. Banning SWDs appeared to improve hunting efficiency among goose hunters at Shiawassee River SGA, and increased overall goose harvest compared to other hunt areas. Among hunters that had hunted at Shiawassee River SGA both before and after the ban of SWDs, a higher proportion of these hunters indicated positive effects from the ban than negative effects. More of these hunters indicated approval for the ban than disapproval. More of these hunters indicated the ban improved the quality of the hunt rather than decreased the quality of their hunt. More of these hunters agreed the ban had led to ducks and geese decoying better and to closer shots than hunters disagreeing with this statement. In addition, more of these hunters agreed the ban had led to a better distribution of duck and goose kill among hunt zones than hunters disagreeing with this statement.*



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## INTRODUCTION

The Michigan Natural Resources Commission (NRC) and Department of Natural Resources (DNR) have the authority and responsibility to protect and manage the wildlife resources of the state of Michigan. Beginning in 2010, the NRC banned spinning-wing decoys (SWDs) from the waterfowl hunts coordinated by the DNR at Shiawassee River State Game Area (SGA) on an experimental basis for three years. This ban was enacted at the request of the Shiawassee Flats Citizens and Hunters Association (SFCHA).

Although research has shown no conclusive biological impacts from the use of SWDs, SFCHA proposed the ban because the use of these decoys could negatively impact the hunting experience of other hunters sharing the area. Some hunters reported SWDs sometimes spooked ducks from an entire area during certain periods of the season.

Opinion surveys are one of the management tools used by the NRC and DNR to accomplish their statutory responsibility. The main objectives of this study were to estimate the number of waterfowl hunters and harvest of waterfowl at Shiawassee River SGA and to determine the opinions of hunters about the use of SWDs and the ban of SWDs for the 2011 hunting season.

## METHODS

Waterfowl could be harvested during hunting seasons that occurred September 1, 2011, through January 29, 2012 (Table 1). DNR personnel at Shiawassee River SGA conduct random drawings for waterfowl hunting opportunities on the property. Hunting parties ( $\geq 1$  hunters) chosen to hunt ducks and geese were required to report the number of ducks and geese harvested and hours spent hunting.

Following the waterfowl hunting season, a questionnaire (Appendix A) was sent to 1,443 people that had been selected to hunt ducks or geese at Shiawassee River SGA in 2011. Hunters receiving the questionnaire were asked to report if they hunted ducks or geese, number of days spent afield, and number of ducks and geese they harvested. Hunters also were asked to indicate their opinion about the effects of the ban of SWDs at Shiawassee River SGA.

Estimates were calculated using a simple random sampling design (Cochran 1977) and were presented along with their 95% confidence limit (CL). This confidence limit can be added and subtracted from the estimate to calculate the 95% confidence interval. The confidence interval is a measure of the precision associated with the estimate and implies that the true value would be within this interval 95 times out of 100. Because hunters were required to report their harvest and hunting effort at Shiawassee River SGA, estimates of hunting effort (days afield), harvest, and effort per harvested duck derived from the survey were adjusted to match known quantities reported by hunters (i.e., bias adjusted estimates). Estimates of hunting effort (days afield) of goose hunters and their hunting effort per harvested goose were not adjusted for biases because comparable information was not collected at the check station for goose hunters because goose hunting was closed during some days when duck hunting occurred (Table 1). In addition, estimates associated with questions about opinions towards regulations were not adjusted for possible response or nonresponse bias because no adjustment factors were available.

Estimates were calculated among all waterfowl hunters participating in 2011. Furthermore, estimates were calculated for four subgroups. These subgroups included: (1) 2011 hunters that also hunted in 2009 at Shiawassee River SGA, (2) 2011 hunters that had hunted in 2009 and had used SWDs in 2009, (3) 2011 hunters that had hunted in 2009 and had not used SWDs in 2009, and (4) 2011 hunters that had not hunted in 2009.

Statistical tests are used routinely to determine the likelihood that the differences among estimates are larger than expected by chance alone. The overlap of 95% confidence intervals was used to determine whether estimates differed. Non-overlapping 95% confidence intervals was equivalent to stating that the difference between the means was larger than would be expected 995 out of 1,000 times, if the study had been repeated (Payton et al. 2003).

Questionnaires were mailed initially during mid-February 2012, and up to two follow-up questionnaires were mailed to nonrespondents. Although 1,443 people were sent the questionnaire, 51 surveys were undeliverable resulting in an adjusted sample size of 1,392. Questionnaires were returned by 919 people, yielding a 66% adjusted response rate.

Waterfowl harvest is routinely monitored each year at several federal and state waterfowl management areas in central Michigan, such as Shiawassee River SGA. SWDs were only banned at Shiawassee River SGA; thus, the other management areas serve as experimental control areas used to assess how the ban of SWDs affected harvest of duck and geese. Areas included in these comparisons included Fish Point Wildlife Area (Tuscola and Huron counties), Muskegon Wastewater Treatment System (Muskegon County), and Shiawassee National Wildlife Refuge (Shiawassee County).

## **RESULTS**

### **Duck Hunting at Shiawassee River SGA**

During 2011, 1,443 people were selected to hunt waterfowl at Shiawassee River SGA (Table 2). Most waterfowl hunters in 2011 at Shiawassee River SGA hunted ducks ( $98 \pm 1\%$ ). Estimates of hunting effort (days afield) of duck hunters, ducks harvested, and hunting effort per harvested duck were calculated initially without any adjustments for biases (Table 3). These initial estimates were adjusted to match known quantities reported by hunters (Table 4). Waterfowl hunters were required to report their harvest and hunting effort at Shiawassee River SGA after they had finished hunting. Because most waterfowl hunters reported hunting ducks, most hunting effort reported at check stations was likely devoted primarily to duck hunting. The unadjusted estimate of hunting effort at Shiawassee River SGA in 2011 was overestimated by 49% and harvest was overestimated by 120%. In contrast, the estimate of effort per harvested duck in 2011 was under estimated by 32%.

Fewer people hunted ducks in 2011 ( $1,418 \pm 7$ ) than in either 2009 ( $1,664 \pm 28$ ) or in 2010 ( $1,638 \pm 29$ ). Waterfowl hunters spent 6,319 days afield and harvested 7,625 ducks in 2011, based on mandatory check tallies (Table 2). The overall number of days spent hunting ducks changed little among the last three years (2009-2011). In contrast, the number of ducks harvested during this period was highest in 2009 and lowest in 2010. In addition, hunters

devoted the fewest number of days of hunting effort per harvested duck in 2009 and most days in 2010.

The number of days of hunting required to harvest a duck in 2009 was 0.73 days among hunters that used SWDs and 0.93 days among hunters that did not use SWDs (Figure 1). In 2010 and 2011, after the SWDs were banned, it took hunters 0.87 days and 0.83 of hunting effort to harvest a duck. None of these estimates of hunting efficiency were significantly different; however, these comparisons were confounded by different hunters participating between years and because some hunters used both hunting methods during the same day in 2009. Thus, estimates of hunting efficiency were also calculated separately among the hunters that hunted all three years (2009-2011). Furthermore, comparisons between years were restricted to hunters that only hunted using one hunting method in 2009 (i.e., hunted only with a SWD or without SWDs). Among hunters that hunted all three years and did not use SWDs in 2009, they devoted  $0.97 \pm 0.17$  days of effort per duck harvested in 2009,  $0.90 \pm 0.13$  days of effort per duck in 2010, and  $0.96 \pm 0.13$  days of effort per duck in 2011 (Figure 2). These estimates were not significantly different between years. Among hunters that hunted ducks all three years and had used SWDs in 2009, they devoted  $0.68 \pm 0.03$  days of effort per duck harvested in 2009,  $0.87 \pm 0.05$  days of effort per duck in 2010, and  $0.82 \pm 0.05$  days of effort per duck in 2011 (Figure 2). Estimates of efficiency were significantly different among years; it required significantly less effort for the same hunter to harvest a duck using SWDs in 2009 than without SWDs in both 2010 and 2011.

Among all duck hunters at Shiawassee River SGA in 2011, 37% approved of the use of SWDs to hunt ducks and 38% disapproved of using SWDs (Table 5). The levels of approval and disapproval of SWDs were not significantly different. The highest levels of approval were reported among hunters that had used SWDs in 2009 (38% approval, Table 5), and the highest levels of disapproval were generally reported among hunters that had not used SWDs in 2009 (55% disapproval).

Among the people hunting ducks in 2011,  $94 \pm 1\%$  indicated they were aware of the ban before they had arrived at Shiawassee River SGA to hunt ducks. Among the people hunting ducks in 2011, 34% indicated the SWD ban improved the quality of their hunt, 19% reported decreased hunt quality, and 46% were not sure whether the ban had changed the quality of their hunt (Table 6). Among 2011 hunters that had used SWDs in 2009, 42% reported the ban had improved the quality of their hunt and 21% reported the ban lowered the quality of their hunt. In contrast, among 2011 hunters that had not used SWDs in 2009, 52% reported the ban had improved the quality of their hunt and 10% reported the ban lowered the quality of their hunt.

Among 2011 duck hunters, 36% indicated the SWD ban resulted in ducks decoying better and closer shots, 28% reported the ban did not improve their hunt, and 36% were not sure whether the ban had caused ducks to respond better to decoys (Table 7). Among 2011 hunters that had used SWDs in 2009, 41% reported the ban had led to ducks decoying better and 31% reported the ban had not led to ducks decoying better. In contrast, among 2011 hunters that had not used SWDs in 2009, 54% reported the ban had led to ducks decoying better and 17% reported the ban did not cause ducks to respond better to decoys.

Among the people hunting ducks in 2011, 38% indicated the SWD ban resulted in a better distribution of duck harvest among hunting zones at Shiawassee River SGA, 25% reported the ban did not cause a better distribution of duck harvest, and 36% were not sure whether the ban had redistributed harvest (Table 8). Among 2011 hunters that had used SWDs in 2009, 43% reported the ban had led to better distribution of harvest and 31% reported the ban had not led to better distribution of harvest. In contrast, among 2011 hunters that had not used SWDs in 2009, 53% reported the ban had led to better distribution of harvest and 20% reported the ban did not cause a better distribution of duck harvest.

Among 2011 duck hunters, 72% indicated the ban had not changed how frequently they hunted at Shiawassee River SGA (Table 9). About 10% of hunters reported they hunted ducks more frequently at Shiawassee River SGA because of the ban, and 11% indicated they hunted less frequently because of the ban.

Among the duck hunters in 2011 that had also hunted in 2009, 38% indicated the ban had not changed how many ducks they had taken at Shiawassee River SGA (Table 10). About 21% of these hunters reported they had taken more ducks at Shiawassee River SGA because of the ban, and 25% indicated they took fewer ducks. The proportion of hunters that indicated they took fewer ducks because of the SWD ban was not significantly different from the proportion of hunters that reported taking more ducks (25% versus 21%). Among the 2011 duck hunters that had used SWDs in 2009, 37% reported no change in the number of ducks harvested because of the ban; however, 28% reported taking fewer ducks and 20% took more ducks because of the ban. Among the 2011 duck hunters that had not hunted with SWDs in 2009, 40% reported no change in the number of ducks harvested because of the ban; however, 12% reported taking fewer ducks and 33% took more ducks because of the ban.

Among 2011 duck hunters, 66% indicated they would not change how frequently they hunted ducks at Shiawassee River SGA in future years (Table 11). A slightly higher proportion of 2011 hunters indicated they planned to hunt more often (15%) than hunters that planned to hunt less often (11%) in the future.

Comparing harvest of ducks at Shiawassee River SGA to harvest at other managed hunt areas where SWDs were not banned was also used to assess the impact of the SWD ban. The change of duck harvest at Shiawassee River SGA closely paralleled changes reported at Fish Point Wildlife Area (Figure 3).

### **Goose Hunting at Shiawassee River SGA**

About  $74 \pm 2\%$  of the waterfowl hunters at Shiawassee River SGA in 2011 hunted geese ( $1,065 \pm 25$ ). Goose hunters were required to report their harvest at Shiawassee River SGA. The initial estimate of goose harvest was adjusted to match harvest reported by these goose hunters (Table 3). The unadjusted estimate of goose harvest at Shiawassee River SGA in 2011 was overestimated by 212%.

Goose hunters spent an estimated  $7,476 \pm 465$  days hunting geese at Shiawassee River SGA in 2011, and the number of days of hunting required to harvest a goose was  $1.52 \pm 0.19$ . Estimates of hunting effort (days afield) of goose hunters and their hunting effort per harvested

goose were not adjusted for biases because comparable information was not collected at the check station for goose hunters.

Among the people hunting geese in 2011, 39% indicated the SWD duck ban improved the quality of their goose hunt, 4% reported decreased hunt quality, and 56% were not sure whether the ban had changed the quality of their goose hunt (Table 12). Among 2011 goose hunters that had used SWDs in 2009, 48% reported the ban had improved the quality of their goose hunt and 4% reported the ban lowered the quality of their goose hunt. In contrast, among 2011 goose hunters that had not used SWDs in 2009, 54% reported the ban had improved the quality of their goose hunt and 3% reported the ban lowered the quality of their goose hunt.

Among the people hunting geese in 2011, 44% indicated the SWD ban resulted in geese decoying better and closer shots, 13% reported the ban did not improve their goose hunt, and 42% were not sure whether the ban had caused geese to respond better to decoys (Table 13). Among 2011 goose hunters that had used SWDs in 2009, 52% reported the ban had led to geese decoying better and 13% reported the ban had not led to geese decoying better. In contrast, among 2011 goose hunters that had not used SWDs in 2009, 57% reported the ban had led to geese decoying better and 7% reported the ban did not cause geese to respond better to decoys.

Among 2011 goose hunters, 37% indicated the SWD ban resulted in a better distribution of goose harvest among hunting zones at Shiawassee River SGA, 14% reported the ban did not cause a better distribution of goose harvest, and 48% were not sure whether the ban had redistributed harvest (Table 14). Among 2011 goose hunters that had used SWDs in 2009, 41% reported the ban had led to better distribution of goose harvest and 18% reported the ban had not led to better distribution of goose harvest. In contrast, among 2011 goose hunters that had not used SWDs in 2009, 51% reported the ban had led to better distribution of harvest and 11% reported the ban did not cause a better distribution of goose harvest.

Among the goose hunters in 2011, 77% indicated the ban had not changed how frequently they hunted geese at Shiawassee River SGA because of the ban of SWDs (Table 15). About 11% of hunters reported they hunted geese more frequently at Shiawassee River SGA because of the ban, and 5% indicated they hunted less frequently because of the ban.

Among 2011 goose hunters, 55% indicated the ban of SWDs had not changed how many geese they had taken at Shiawassee River SGA (Table 16). About 23% of these hunters reported they had taken more geese at Shiawassee River SGA because of the ban, and 7% indicated they took fewer geese. The proportion of hunters that indicated they took more geese because of the SWD ban was significantly greater than the proportion of hunters that reporting taking fewer geese (23% versus 7%). Among the 2011 goose hunters that had used SWDs in 2009, 53% reported no change in the number of geese harvested because of the ban; however, 29% reported taking more geese and 8% took fewer geese because of the ban. Among the 2011 goose hunters that had not hunted with SWDs in 2009, 51% reported no change in the number of geese harvested because of the ban; however, 33% reported taking more geese and 4% took fewer geese because of the ban.

Among the goose hunters in 2011, 71% indicated they would not change how frequently they hunted geese at Shiawassee River SGA in future years because of the ban of SWDs (Table 17). However, a higher proportion of 2011 goose hunters indicated they planned to hunt more often (16%) than hunters that planned to hunt less often (5%) in the future.

Comparing harvest of geese at Shiawassee River SGA to harvest at other managed hunt areas where SWDs were not banned offered another way to assess the impact of the SWD ban. Goose harvest at Shiawassee River SGA generally increased more after the ban of SWDs than reported at other areas (Figure 3).

## DISCUSSION

Mail surveys are a cost-efficient method of obtaining information about hunting activity, but there are many possible sources of error in surveys such as the failure of participants to provide answers (nonresponse bias), question wording, and question order (Cochran 1977, Lohr 1999, Dillman 2000). The unadjusted estimate of duck hunting effort at Shiawassee River SGA in 2011 was overestimated by 49%; duck harvest was overestimated by 120%; and goose harvest was overestimated by 212% (Table 3). Similar to this study, Wright (1978) compared estimates of hunting activity and harvest of waterfowl hunters derived from a mail survey to information reported at a mandatory check station. The estimate of waterfowl harvest was overestimated by about 100%, and the number of hunting trips was overestimated by 35%. Wright attributed the largest source of bias associated with the harvest estimate to hunters reporting the take of hunting partners, rather than only reporting their harvest. However, estimates could also be biased if hunters failed to remember their activities (recall bias), exaggerated their success to appear more successful (prestige bias), or reported harvest of birds shot but not recovered.

Because waterfowl hunters at Shiawassee River SGA reported who accompanied them while hunting (i.e., party members), it was possible to recalculate waterfowl harvest assuming every hunting party member had reported the total kill of the hunting party on their survey. Assuming harvested birds were reported by all party members, hunters would be expected to report taking 18,241 ducks and 3,735 geese in 2011. The unadjusted harvest estimate of 16,781 ducks and from the mail survey (Table 3) was only 8% less than what would be expected if double counting had occurred, and goose harvest (4,401) was 18% greater than expected. Thus, double counting of harvested birds was potentially a major source of error in this survey.

The Shiawassee Flats Citizens and Hunters Association (SFCHA) originally proposed the ban of SWDs at Shiawassee River SGA because the use of these decoys could negatively impact the duck hunting experience of other hunters sharing the same area. In 2009, 45% of hunters at Shiawassee River SGA approved of using SWDs, 31% disapproved of their use, and 23% were undecided (Frawley 2012). Moreover, 35% of the duck hunters at Shiawassee River SGA in 2009 agreed that SWDs should be banned because when used improperly they could negatively impact other nearby hunters (Frawley 2012). In contrast, 45% of hunters disagreed that SWDs should be banned because they could impact hunting activity of other hunters. Thus, prior to the ban, a substantial proportion of hunters were concerned about the use of SWDs; however, most hunters did not agree that a ban of SWDs was necessary.

In 2011, after the ban had been in place for two hunting seasons, 37% of the duck hunters at Shiawassee River SGA approved of using SWDs on the property, 38% disapproved of their use, and 25% were undecided (Frawley 2012). Thus, approval of SWDs among active duck hunters on the property has decreased slightly between 2009 and 2011 (45% versus 37% approval of SWDs).

In 2009, prior to the ban of SWDs, 78% of the hunters at Shiawassee River SGA used SWDs (Frawley 2012). These hunters using SWDs at Shiawassee River SGA in 2009 were more efficient at harvesting ducks than hunters that did not use SWDs (Figure 1, Frawley 2012). After SWDs were banned, however, efficiency of hunters that previously used SWDs was not significantly different from hunters that had never previously used SWDs in both 2010 and 2011. Thus, in retrospect, it appeared SWDs had improved the efficiency of duck hunters who used SWDs at Shiawassee River SGA.

Changes in duck harvest at both Shiawassee River SGA and Fish Point Wildlife Area were similar during 2009-2011, despite the ban of SWDs at Shiawassee River SGA. Thus, the ban did not appear to influence overall duck harvest, although the ban of SWDs lowered the efficiency of duck hunters that had previously used SWDs at Shiawassee River SGA.

Changes in yearly goose harvest at Shiawassee River SGA after SWDs were banned did not parallel changes in goose harvest reported at other managed waterfowl areas such as Fish Point Wildlife Area (Figure 2). Goose harvests during the last two years at Shiawassee River SGA (i.e., since SWDs were banned) were the highest recorded during the last ten years. In contrast, goose harvests at other managed waterfowl areas during the last three years were unchanged or increased less than reported at Shiawassee River SGA. Thus, the ban appeared to improve overall goose harvest at Shiawassee River SGA.

Among duck hunters that had hunted at Shiawassee River SGA both before and after the ban of SWDs, a higher proportion of these hunters indicated positive effects from the ban than negative effects. More of these duck hunters indicated approval for the ban than disapproval (43% versus 28%, Table 5). More of these duck hunters indicated the ban improved the quality of the hunt rather than decreased the quality of their hunt (42% versus 19%, Table 6). More of these hunters agreed the ban had led to ducks decoying better and to closer shots than hunters disagreeing with this statement (42% versus 28%, Table 7). In addition, more of these hunters agreed the ban had led to a better distribution of duck kill among hunt zones than hunters disagreeing with this statement (44% versus 29%, Table 8).

Among goose hunters that had hunted at Shiawassee River SGA both before and after the ban of SWDs, a higher proportion of these goose hunters indicated positive effects from the ban than negative effects. More of these goose hunters indicated the ban improved the quality of their goose hunt rather than decreased the quality of their hunt (45% versus 5%, Table 12). More of these goose hunters agreed the ban had led to geese decoying better and to closer shots than hunters disagreeing with this statement (49% versus 13%, Table 13). In addition, more of these hunters agreed the ban had led to a better distribution of goose kill among hunt zones than hunters disagreeing with this statement (41% versus 17%, Table 14). Compared to ducks hunters, goose hunters generally reported more positive effects as a result of the ban of SWDs.

Among duck hunters at Shiawassee River SGA in both 2009 and 2011, 74% reported that the ban of SWDs did not affect how frequently they hunted ducks (Table 9). In contrast, 13% indicated they duck hunted less frequently because of the ban, and 11% reported they hunted more frequently. Thus among duck hunters that have hunted both before and after the SWD ban was implemented, the ban of SWDs generally has not changed how frequently they hunted ducks at Shiawassee River SGA in 2011.

Among goose hunters at Shiawassee River SGA in both 2009 and 2011, 80% reported that the ban of SWDs did not affect how frequently they hunted geese (Table 15). In contrast, 12% indicated they goose hunted more frequently because of the ban, and 5% reported they hunted geese less frequently. Although most goose hunters had not increased how often they hunted geese, a larger proportion of goose hunters reported they had harvested more geese than hunters reporting taking fewer geese (54% versus 27%). Thus, goose hunters appeared to be more efficient (i.e., harvest of geese increased more than hunting effort), which was consistent with overall increase of geese taken in 2011 than 2009 (mandatory check tally was 846 geese in 2009 and 1,409 geese in 2011; Table 2).

Among the 2011 duck hunters at Shiawassee River SGA, a higher proportion indicated they would increase (15%) their duck hunting activity as hunters than would decrease (11%) their duck hunting activity because of the ban of SWDs (Table 11). Among the 2011 goose hunters at Shiawassee River SGA, a higher proportion indicated they would increase (15%) their goose hunting activity than hunters that would decrease (5%) their goose hunting activity because of the ban of SWDs (Table 17). Thus, the net effect of the ban of SWDs on hunting effort in the next two years is predicted to be slightly positive for both duck and geese hunters.

Duck hunting efficiency (i.e., hunting effort per harvested bird) at Shiawassee River SGA declined because of the ban of SWDs; however, goose hunting efficiency improved because of the ban. Thus, a small increase in hunting effort at Shiawassee River SGA in the future with the continuation of the SWD ban may marginally increase future harvest of ducks. In contrast, a small increase in hunting effort for geese in the future should lead to a more notable increase in the harvest of geese.

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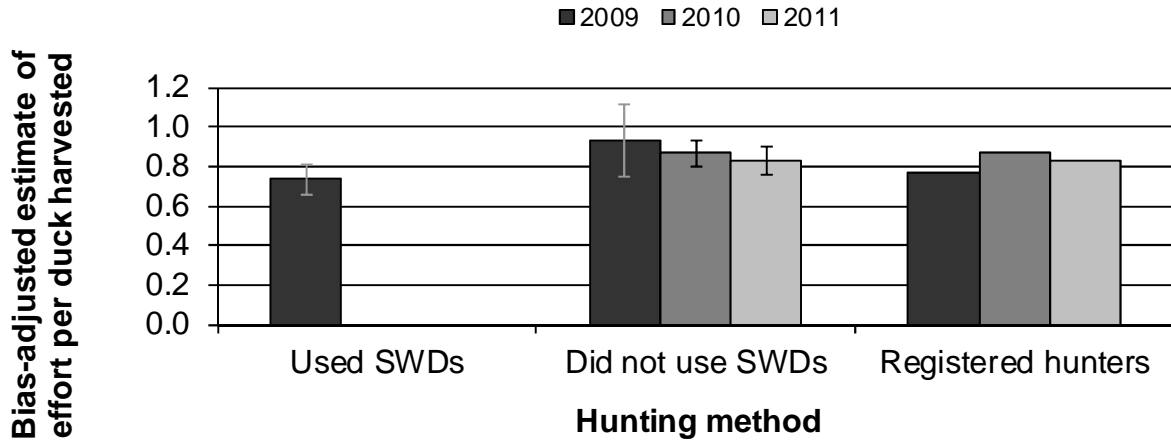


Figure 1. Estimated number of days of effort required to take a duck at Shiawassee River SGA by hunting method during 2009-2011 hunting seasons. Vertical bars represent the 95% confidence interval. The estimate for all registered hunters was derived from data collected from all hunters at Shiawassee River SGA (i.e. mandatory reporting).

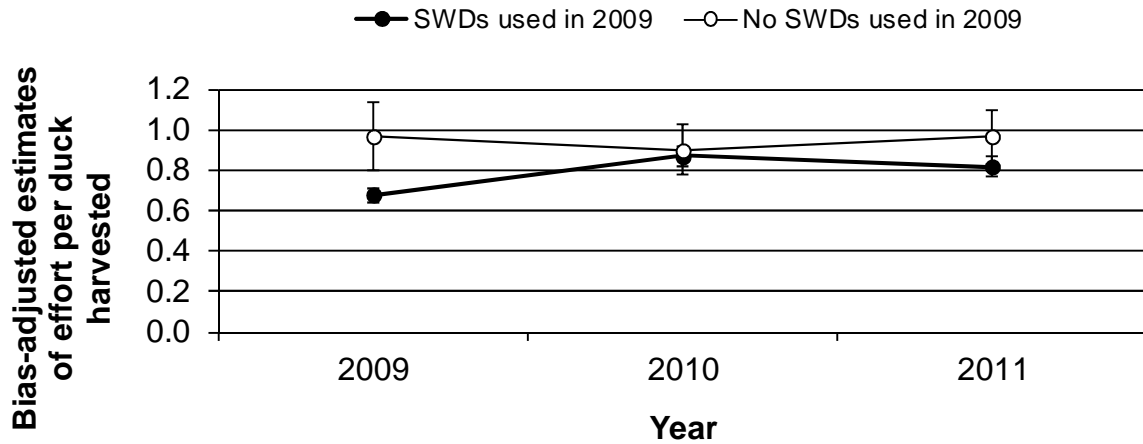


Figure 2. Estimated number of days of effort required to take a duck at Shiawassee River SGA by hunting method during 2009-2010. Vertical bars represent the 95% confidence interval. Hunters that did not hunt both years and hunters that used more than one hunting method in 2009 were excluded from sample of hunters used to derive estimates.

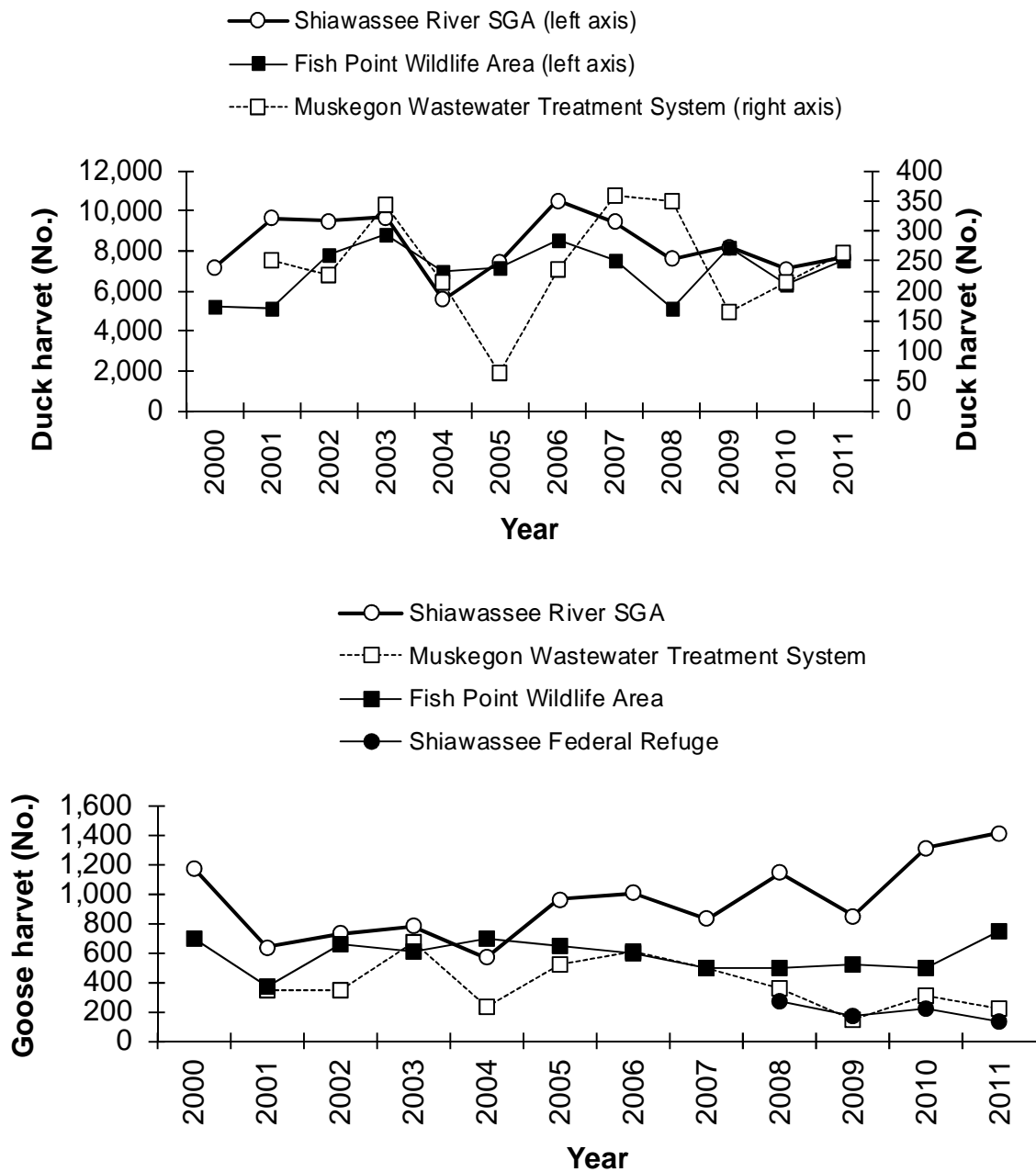


Figure 2. Number of ducks and geese taken at Shiawassee River SGA, Muskegon Wastewater Treatment System, Fish Point Wildlife Area, and Shiawassee Federal Refuge during 2000-2011. Harvest totals from mandatory registration tallies.

Table 1. Waterfowl hunting seasons at Shiawassee River SGA in Michigan, 2011-2012.

Species and season	Season dates	Bag limits	
		Daily	Possession
Ducks <sup>a</sup>	Oct. 8 – Dec. 4 and Dec. 10 – 11	6	12
Canada geese <sup>a</sup>			
Early season	Sept. 1 – 10	5	10
Regular season	Oct. 8 – Nov. 10, Nov. 24 – Dec. 4, and Dec. 31 – Jan. 29	2	4
Late season	Dec. 31 – Jan. 29	5	10

<sup>a</sup>Ducks and geese could also be taken during a special 2-day Youth Season (September 17-18).

Table 2. Number of waterfowl hunters, hunting effort, and harvest reported at mandatory check station at Shiawassee River SGA during 2009-2011.

Year	Waterfowl hunters <sup>a</sup> (No.)	Hunting effort (No. days)	Duck harvest (No.)	Mean effort/duck harvested	Goose harvest (No.)
2009	1,732	6,290	8,207	0.77	846
2010	1,638	6,145	7,084	0.87	1,309
2011	1,443	6,319	7,625	0.83	1,409

<sup>a</sup>Includes both duck and goose hunters.

Table 3. Differences between survey estimates and harvest tallies from mandatory harvest checks of waterfowl hunters at Shiawassee River SGA in 2011.

Source of estimate and differences between estimates	Estimate			
	Duck hunting effort (No. days)	Duck harvest (No.)	Mean effort/duck harvested	Goose harvest (No.)
Unadjusted survey estimate	9,416	16,781	0.56	4,401
Mandatory check tally	6,319	7,625	0.83	1,409
Difference (%)	49	120	-32	212
Correction factor	0.671063	0.454395	1.476829	0.320144

Table 4. Bias-adjusted estimates of the number of duck hunters, days of hunting effort, duck harvest, and hunting effort per duck harvested at Shiawassee River SGA, summarized by year and hunting method used (i.e., used SWDs or did not use SWDs).<sup>a</sup>

Duck hunters		Duck hunting effort		Duck harvest		Effort/duck harvested	
No.	95% CL	No.	95% CL	No.	95% CL	Mean	95% CL
1,418	7	6,319	314	7,625	546	0.83	0.07

<sup>a</sup>Original estimates presented in Table 1 were adjusted for bias using the correction factor presented in Table 2, except estimates of hunter numbers which were not adjusted.

Table 5. Proportion of duck hunters that approved or disapproved of hunting ducks with SWDs at Shiawassee River SGA.<sup>a</sup>

Duck hunter group	Hunters in group <sup>b</sup>		Opinion of hunters							
			Approved		Not sure		Disapproved		No answer	
	No.	95% CL	%	95% CL	%	95% CL	%	95% CL	%	95% CL
Hunted 2011	1,418	7	37	2	25	2	38	2	1	0
Hunted 2011 and 2009	793	28	37	3	19	2	43	3	1	0
Hunted 2011 and 2009, used SWDs in 2009	590	28	38	3	18	2	44	3	1	1
Hunted 2011 and 2009, no SWDs used in 2009	308	23	27	4	18	3	55	4	0	0
Hunted 2011 but not in 2009	625	28	37	3	31	3	31	3	1	0

<sup>a</sup>Estimates among active hunters (i.e., excluded people that did not hunt ducks).

<sup>b</sup>Unadjusted estimates.

Table 6. Proportion of duck hunters that reported the ban of SWDs improved or decreased the quality of duck hunting at Shiawassee River SGA in 2011.<sup>a</sup>

Duck hunter group	Hunters in group <sup>b</sup>		Opinion of hunters							
			Improved		Not sure		Decreased		No answer	
	No.	95% CL	%	95% CL	%	95% CL	%	95% CL	%	95% CL
Hunted 2011	1,418	7	34	2	46	2	19	2	1	0
Hunted 2011 and 2009	793	27	42	3	38	3	19	2	1	1
Hunted 2011 and 2009, used SWDs in 2009	590	27	42	3	36	3	21	2	1	1
Hunted 2011 and 2009, no SWDs used in 2009	308	22	52	4	37	4	10	2	2	1
Hunted 2011 but not in 2009	625	27	25	3	57	3	18	2	1	0

<sup>a</sup>Estimates among active hunters (i.e., excluded people that did not hunt ducks).

<sup>b</sup>Unadjusted estimates.

Table 7. Proportion of duck hunters that reported the ban of SWDs resulted in ducks decoying better and closer shots at Shiawassee River SGA in 2011.<sup>a</sup>

Duck hunter group	Hunters in group <sup>b</sup>		Opinion of hunters							
			Agree		Not sure		Disagree		No answer	
	No.	95% CL	%	95% CL	%	95% CL	%	95% CL	%	95% CL
Hunted 2011	1,418	7	36	2	36	2	28	2	1	0
Hunted 2011 and 2009	793	27	42	3	30	2	28	2	0	0
Hunted 2011 and 2009, used SWDs in 2009	590	27	41	3	28	3	31	3	0	0
Hunted 2011 and 2009, no SWDs used in 2009	308	22	54	4	29	4	17	3	0	0
Hunted 2011 but not in 2009	625	27	29	3	42	3	27	3	2	1

<sup>a</sup>Estimates among active hunters (i.e., excluded people that did not hunt ducks).

<sup>b</sup>Unadjusted estimates.

Table 8. Proportion of duck hunters that reported the ban of SWDs led to a better distribution of duck harvest among hunting zones at Shiawassee River SGA in 2011.<sup>a</sup>

Duck hunter group	Hunters in group <sup>b</sup>		Opinion of hunters							
			Agree		Not sure		Disagree		No answer	
	No.	95% CL	%	95% CL	%	95% CL	%	95% CL	%	95% CL
Hunted 2011	1,418	7	38	2	36	2	25	2	1	0
Hunted 2011 and 2009	793	27	44	3	27	2	29	2	0	0
Hunted 2011 and 2009, used SWDs in 2009	590	27	43	3	25	3	31	3	1	0
Hunted 2011 and 2009, no SWDs used in 2009	308	22	53	4	26	4	20	3	1	1
Hunted 2011 but not in 2009	625	27	31	3	47	3	20	2	2	1

<sup>a</sup>Estimates among active hunters (i.e., excluded people that did not hunt ducks).

<sup>b</sup>Unadjusted estimates.

Table 9. Proportion of duck hunters that increased or decreased how often they hunted at Shiawassee River SGA in 2011 because of the ban of SWDs.<sup>a</sup>

Duck hunter group	Hunters in group <sup>b</sup>		Opinion of hunters									
			Increased		Decreased		No change		Not sure		No answer	
	No.	95% CL	%	95% CL	%	95% CL	%	95% CL	%	95% CL	%	95% CL
Hunted 2011	1,418	7	10	1	11	1	72	2	7	1	0	0
Hunted 2011 and 2009	793	27	11	2	13	2	74	2	2	1	0	0
Hunted 2011 and 2009, used SWDs in 2009	590	27	10	2	14	2	74	3	1	1	0	0
Hunted 2011 and 2009, no SWDs used in 2009	308	22	16	3	6	2	76	4	2	1	0	0
Hunted 2011 but not in 2009	625	27	9	2	7	2	68	3	15	2	0	0

<sup>a</sup>Estimates among active hunters (i.e., excluded people that did not hunt ducks).

<sup>b</sup>Unadjusted estimates.

Table 10. Proportion of duck hunters that reported increased or decreased harvest of ducks at Shiawassee River SGA in 2011 following the ban of SWDs.<sup>a</sup>

Duck hunter group	Hunters in group <sup>b</sup>		Opinion of hunters									
			Increased		Decreased		No change		Not sure		No answer	
	No.	95% CL	%	95% CL	%	95% CL	%	95% CL	%	95% CL	%	95% CL
Hunted 2011	1,418	7	17	1	20	2	41	2	23	2	0	0
Hunted 2011 and 2009	793	27	21	2	25	2	38	3	15	2	0	0
Hunted 2011 and 2009, used SWDs in 2009	590	27	20	2	28	3	37	3	15	2	0	0
Hunted 2011 and 2009, no SWDs used in 2009	308	22	33	4	12	3	40	4	15	3	0	0
Hunted 2011 but not in 2009	625	27	11	2	14	2	43	3	32	3	1	1

<sup>a</sup>Estimates among active hunters (i.e., excluded people that did not hunt ducks).

<sup>b</sup>Unadjusted estimates.

Table 11. Proportion of duck hunters that reported they would increase or decrease how often they hunted ducks at Shiawassee River SGA in future years because of the ban of SWDs.<sup>a</sup>

Duck hunter group	Hunters in group <sup>b</sup>		Opinion of hunters									
			Increase		Decrease		No change		Not sure		No answer	
	No.	95% CL	%	95% CL	%	95% CL	%	95% CL	%	95% CL	%	95% CL
Hunted 2011	1,418	7	15	1	11	1	66	2	7	1	1	0
Hunted 2011 and 2009	793	27	15	2	12	2	68	2	4	1	1	0
Hunted 2011 and 2009, used SWDs in 2009	590	27	14	2	12	2	70	3	4	1	0	0
Hunted 2011 and 2009, no SWDs used in 2009	308	22	22	3	5	2	68	4	4	2	1	1
Hunted 2011 but not in 2009	625	27	16	2	10	2	63	3	11	2	1	1

<sup>a</sup>Estimates among active hunters (i.e., excluded people that did not hunt ducks).

<sup>b</sup>Unadjusted estimates.

Table 12. Proportion of goose hunters that reported the ban of SWDs improved or decreased the quality of goose hunting at Shiawassee River SGA in 2011.<sup>a</sup>

Goose hunter group	Hunters in group <sup>b</sup>		Opinion of hunters							
			Improved		Not sure		Decreased		No answer	
	No.	95% CL	%	95% CL	%	95% CL	%	95% CL	%	95% CL
Goose hunted 2011	1,065	25	39	2	56	2	4	1	1	0
Hunted geese in 2011 and ducks in 2009	672	28	45	3	50	3	5	1	1	0
Hunted geese in 2011 and ducks in 2009, used SWDs in 2009	504	27	48	3	47	3	4	1	1	1
Hunted geese in 2011 and ducks in 2009, no SWDs used in 2009	275	22	54	4	43	4	3	1	0	0
Hunted geese in 2011 but not in 2009	393	25	28	3	68	3	4	1	0	0

<sup>a</sup>Estimates among active 2011 hunters (i.e., excluded people that did not hunt geese in 2011).

<sup>b</sup>Unadjusted estimates.

Table 13. Proportion of goose hunters that reported the ban of SWDs resulted in geese decoying better and closer shots at Shiawassee River SGA in 2011.<sup>a</sup>

Goose hunter group	Hunters in group <sup>b</sup>		Opinion of hunters							
			Agree		Not sure		Disagree		No answer	
	No.	95% CL	%	95% CL	%	95% CL	%	95% CL	%	95% CL
Goose hunted 2011	1,065	25	44	2	42	2	13	1	2	1
Hunted geese in 2011 and ducks in 2009	672	28	49	3	36	3	13	2	1	1
Hunted geese in 2011 and ducks in 2009, used SWDs in 2009	504	27	52	3	34	3	13	2	1	1
Hunted geese in 2011 and ducks in 2009, no SWDs used in 2009	275	22	57	4	34	4	7	2	2	1
Hunted geese in 2011 but not in 2009	393	25	35	4	50	4	12	2	3	1

<sup>a</sup>Estimates among active 2011 hunters (i.e., excluded people that did not hunt geese in 2011).

<sup>b</sup>Unadjusted estimates.

Table 14. Proportion of goose hunters that reported the ban of SWDs led to a better distribution of goose harvest among hunting zones at Shiawassee River SGA in 2011.<sup>a</sup>

Goose hunter group	Hunters in group <sup>b</sup>		Opinion of hunters							
			Agree		Not sure		Disagree		No answer	
	No.	95% CL	%	95% CL	%	95% CL	%	95% CL	%	95% CL
Hunted geese in 2011	1,065	25	37	2	48	2	14	2	1	1
Hunted geese in 2011 and ducks in 2009	672	28	41	3	41	3	17	2	1	1
Hunted geese in 2011 and ducks in 2009, used SWDs in 2009	504	27	41	3	39	3	18	3	1	1
Hunted geese in 2011 and ducks in 2009, no SWDs used in 2009	275	22	51	4	37	4	11	3	1	1
Hunted geese in 2011 but not in 2009	393	25	31	3	58	4	9	2	2	1

<sup>a</sup>Estimates among active 2011 hunters (i.e., excluded people that did not hunt geese in 2011).

<sup>b</sup>Unadjusted estimates.

Table 15. Proportion of goose hunters that increased or decreased how often they hunted geese at Shiawassee River SGA in 2011 because of the ban of SWDs.<sup>a</sup>

Goose hunter group	Hunters in group <sup>b</sup>		Opinion of hunters									
	No.	95% CL	Increased		Decreased		No change		Not sure		No answer	
			%	95% CL	%	95% CL	%	95% CL	%	95% CL	%	95% CL
Hunted geese in 2011	1,065	25	11	1	5	1	77	2	7	1	0	0
Hunted geese in 2011 and ducks in 2009	672	28	12	2	5	1	80	2	3	1	0	0
Hunted geese in 2011 and ducks in 2009, used SWDs in 2009	504	27	12	2	5	1	82	3	2	1	0	0
Hunted geese in 2011 and ducks in 2009, no SWDs used in 2009	275	22	15	3	3	1	78	4	3	2	0	0
Hunted geese in 2011 but not in 2009	393	25	10	2	4	2	71	3	13	2	1	1

<sup>a</sup>Estimates among active 2011 hunters (i.e., excluded people that did not hunt geese in 2011).

<sup>b</sup>Unadjusted estimates.

Table 16. Proportion of goose hunters that reported increased or decreased harvest of geese at Shiawassee River SGA in 2011 following the ban of SWDs.<sup>a</sup>

Goose hunter group	Hunters in group <sup>b</sup>		Opinion of hunters									
			Increased		Decreased		No change		Not sure		No answer	
	No.	95% CL	%	95% CL	%	95% CL	%	95% CL	%	95% CL	%	95% CL
Hunted geese in 2011	1,065	25	23	2	7	1	55	2	15	2	0	0
Hunted geese in 2011 and ducks in 2009	672	28	27	3	8	2	54	3	11	2	0	0
Hunted geese in 2011 and ducks in 2009, used SWDs in 2009	504	27	29	3	8	2	53	3	10	2	1	1
Hunted geese in 2011 and ducks in 2009, no SWDs used in 2009	275	22	33	4	4	2	51	4	11	3	0	0
Hunted geese in 2011 but not in 2009	393	25	16	3	4	2	57	4	22	3	0	0

<sup>a</sup>Estimates among active 2011 hunters (i.e., excluded people that did not hunt geese in 2011).

<sup>b</sup>Unadjusted estimates.

Table 17. Proportion of goose hunters that reported they would increase or decrease how often they hunted geese at Shiawassee River SGA in future years because of the ban of SWDs.<sup>a</sup>

Goose hunter group	Hunters in group <sup>b</sup>		Opinion of hunters									
			Increase		Decrease		No change		Not sure		No answer	
	No.	95% CL	%	95% CL	%	95% CL	%	95% CL	%	95% CL	%	95% CL
Hunted geese in 2011	1,065	25	16	2	5	1	71	2	7	1	1	0
Hunted geese in 2011 and ducks in 2009	672	28	15	2	5	1	75	2	4	1	1	1
Hunted geese in 2011 and ducks in 2009, used SWDs in 2009	504	27	14	2	5	1	77	3	3	1	2	1
Hunted geese in 2011 and ducks in 2009, no SWDs used in 2009	275	22	21	4	3	1	71	4	4	2	1	1
Hunted geese in 2011 but not in 2009	393	25	17	3	6	2	66	3	11	2	0	0

<sup>a</sup>Estimates among active 2011 hunters (i.e., excluded people that did not hunt geese in 2011).

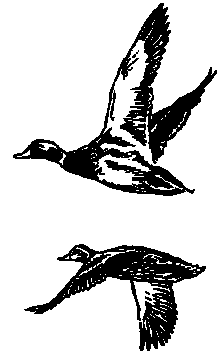
<sup>b</sup>Unadjusted estimates.

Appendix A. The questionnaire sent to a sample of duck hunters in this study.



WATERFOWL HARVEST REPORT FOR THE  
SHIAWASSEE RIVER STATE GAME AREA

This information is requested under authority of Part 435, 1994 PA 451, M.C.L. 324.43539.



*It is important that you complete this questionnaire even if you did not harvest any ducks or geese. Report only your hunting activities and the birds that you harvested.*

Section 1: Duck Hunting at Shiawassee River State Game Area (SGA) in 2011

1. Prior to 2011, how many years have you hunted ducks at Shiawassee River SGA? \_\_\_\_\_ years
2. In 2011, did you hunt ducks at Shiawassee River SGA? <sup>1</sup> ☐ Yes <sup>2</sup> ☐ No (If "No", skip to question number 8.)
3. How many days did you hunt ducks at Shiawassee River SGA in 2011? \_\_\_\_\_ days
4. How many ducks did you harvest at Shiawassee River SGA in 2011? \_\_\_\_\_ ducks
5. Were you aware of the ban on spinning wing decoys before you arrived at Shiawassee River SGA? <sup>1</sup> ☐ Yes <sup>2</sup> ☐ No
6. How did the ban on spinning-wing decoys affect the quality of your duck hunting experience at Shiawassee River SGA?  
<sup>1</sup> ☐ Greatly Improved quality of hunt   <sup>2</sup> ☐ Improved quality of hunt   <sup>3</sup> ☐ Not Sure   <sup>4</sup> ☐ Decreased quality of hunt   <sup>5</sup> ☐ Greatly decreased quality of hunt
7. How much do you agree or disagree with the following statements about the effects of the ban of spinning-wing decoys on duck hunting at Shiawassee River SGA.

	Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
a. The ban of spinning-wing decoys resulted in ducks decoying better and closer shots.	<sup>1</sup> <input type="checkbox"/>	<sup>2</sup> <input type="checkbox"/>	<sup>3</sup> <input type="checkbox"/>	<sup>4</sup> <input type="checkbox"/>	<sup>5</sup> <input type="checkbox"/>
b. The ban of spinning-wing decoys has led to a better distribution of duck harvest among hunting zones.	<sup>1</sup> <input type="checkbox"/>	<sup>2</sup> <input type="checkbox"/>	<sup>3</sup> <input type="checkbox"/>	<sup>4</sup> <input type="checkbox"/>	<sup>5</sup> <input type="checkbox"/>
8. How much do you approve or disapprove of hunting ducks at Shiawassee River SGA with the aid of spinning-wing decoys?  
<sup>1</sup> ☐ Strongly Approve   <sup>2</sup> ☐ Approve   <sup>3</sup> ☐ Not Sure   <sup>4</sup> ☐ Disapprove   <sup>5</sup> ☐ Strongly Disapprove
9. Since spinning-wing decoys were banned in 2010, how did this ban affect how often you hunted ducks at Shiawassee River SGA? (Select one choice)  
<sup>1</sup> ☐ Increased   <sup>2</sup> ☐ Decreased   <sup>3</sup> ☐ No change   <sup>4</sup> ☐ Not sure
10. Since spinning-wing decoys were banned in 2010, how did this ban affect how many ducks you harvested at Shiawassee River SGA? (Select one choice)  
<sup>1</sup> ☐ Increased   <sup>2</sup> ☐ Decreased   <sup>3</sup> ☐ No change   <sup>4</sup> ☐ Not sure

Continued on next page

11. Did you avoid hunting ducks completely on Shiawassee River SGA in 2011 because you could not use spinning-wing decoys?
- <sup>1</sup> ☐ Yes                      <sup>2</sup> ☐ No                      <sup>3</sup> ☐ Uncertain
12. How do you believe the ban on spinning wing decoys will affect how often you will hunt ducks at Shiawassee River SGA in future years? (Select one choice)
- <sup>1</sup> ☐ Increase                      <sup>2</sup> ☐ Decrease                      <sup>3</sup> ☐ No change                      <sup>4</sup> ☐ Not sure

Section 2: Goose Hunting at Shiawassee River State Game Area (SGA) in 2011

13. Prior to 2011, how many years have you hunted geese at Shiawassee River SGA? \_\_\_\_\_ years
14. In 2011, did you hunt geese at Shiawassee River SGA?                      <sup>1</sup> ☐ Yes                      <sup>2</sup> ☐ No (If “No”, skip to question number 19.)
15. How many days did you hunt geese at Shiawassee River SGA in 2011? \_\_\_\_\_ days
16. How many geese did you harvest at Shiawassee River SGA in 2011? \_\_\_\_\_ geese
17. How did the ban on spinning-wing decoys affect the quality of your goose hunting experience at Shiawassee River SGA?
- <sup>1</sup> ☐ Greatly Improved quality of hunt                      <sup>2</sup> ☐ Improved quality of hunt                      <sup>3</sup> ☐ Not Sure                      <sup>4</sup> ☐ Decreased quality of hunt                      <sup>5</sup> ☐ Greatly decreased quality of hunt
18. How much do you agree or disagree with the following statements about the effects of the ban of spinning-wing decoys on goose hunting at Shiawassee River SGA.
- |                                                                                                                  | Strongly Agree                        | Agree                                 | Not Sure                              | Disagree                              | Strongly Disagree                     |
|------------------------------------------------------------------------------------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| a. The ban of spinning-wing decoys resulted in <u>geese</u> decoying better and closer shots.                    | <sup>1</sup> <input type="checkbox"/> | <sup>2</sup> <input type="checkbox"/> | <sup>3</sup> <input type="checkbox"/> | <sup>4</sup> <input type="checkbox"/> | <sup>5</sup> <input type="checkbox"/> |
| b. The ban of spinning-wing decoys has led to a better distribution of <u>goose</u> harvest among hunting zones. | <sup>1</sup> <input type="checkbox"/> | <sup>2</sup> <input type="checkbox"/> | <sup>3</sup> <input type="checkbox"/> | <sup>4</sup> <input type="checkbox"/> | <sup>5</sup> <input type="checkbox"/> |
19. Since spinning-wing decoys were banned in 2010, how did this ban affect how often you hunted geese at Shiawassee River SGA? (Select one choice)
- <sup>1</sup> ☐ Increased                      <sup>2</sup> ☐ Decreased                      <sup>3</sup> ☐ No change                      <sup>4</sup> ☐ Not sure
20. Since spinning-wing decoys were banned in 2010, how did this ban affect how many geese you harvested at Shiawassee River SGA? (Select one choice)
- <sup>1</sup> ☐ Increased                      <sup>2</sup> ☐ Decreased                      <sup>3</sup> ☐ No change                      <sup>4</sup> ☐ Not sure
21. How do you believe the ban on spinning wing decoys will affect how often you hunt geese at Shiawassee River SGA in future years? (Select one choice)
- <sup>1</sup> ☐ Increase                      <sup>2</sup> ☐ Decrease                      <sup>3</sup> ☐ No change                      <sup>4</sup> ☐ Not sure